NPOESS
Requirements Issue Form

Priority (1,2 or 3): 1   RI#: 1

NPOESS Action Officer: JARG   Phone:

Date Opened: 3 1 Jan 95   Due Date: Response Date:

Issue: Are RDRs with radiometric calibration required at all regional sites and which EDRs are required at the regional sites? <u>RDRs with radiometric calibration are reauired at all NOAA reinonal sites. No EDRs are required at any NOAA regional site, only RDRs.</u>

NPOESS
Requirements Issue Form

Priority (1,2 or 3): 1   **RI#: 2**

NPOESS Action Officer: JARG   Phone:

Date Opened: 31 Jan 95   Due Date: Response Date: 28 Feb 95

Issue: Are refresh requirements defined for the optimal case (evenly spaced) or for any case? <u>Yes, optimal</u>

Specifically, what are the requirements for launch insertion. <u>None</u>

What is the definition of contiguous coverage, and how does this relate to refresh rate? For example, for the requirement "contiguous full earth coverage with a threshold of 4 hours refesh" (IORD para 4.1, pg 13), is it the intent to have swath to swath contiguous coverage or that every location on the earth is revisited every 4 hours? <u>The later, for Phase 0 there is no "contiguous converage" requirement.</u>

What are the coverage requirements for each EDR? <u>As stated in the refresh requirements.</u>

NPOESS
Requirements Issue Form

Priority (1,2 or 3): 1   RI#: 3

NPOESS Action Officer: JARG   Phone:

Date Opened: 3 1 Jan 95   Due Date: Response Date: 15 Mar 95

Issue: Sea Ice requirements clarification.

What is the definition for ice edge boundary (i.e. ice concentration ≥25%)?0/10
Concentration or no ice

Should this be measured in meters or as ice/no ice? ice/no ice

Should ice motion be in meters or meters/day? meters/day

Should leads/polynyas be measured in meters or as yes/no? meters. the size of the
leads/polynyas is what should be measured

Define the latitudinal extent necessary for global sea ice coverage. Geographic areas
north of 36N and south of 50S

Is the requirement for ice thickness vertical sampling interval meaningful and/or is it
already covered under the other parameters? NO, it is already covered under other
parameters

Should the objective for sea ice sensing depth match the measurement range value? In
the "ideal world" sea ice sensing depth should at least be as large as the maximum depth
an icebreaker can break and/or a submarine can penetrate during a surfacing. The
sensing depth threshold applies to the measurement of all the sea ice parameters
EXCEPT sea ice thickness...this is why thickness thresholds are all listed TBD. the
sensing depth objective of 10 meters was chosen because it is the mean maximum
thickness of multi-year ice.

What is the specific content expected in the EDR? Ice concentration value (in tenths
coverage), ice age (new. 1st year and +2 year old ice flag). ice motion (km/day) and ice
thickness (meters).

Provide an example of how measurement accuracy applies to the other parameters for
this EDR. The boundary of the ice edge is determined by the limit of depicted ice
concentration values.. . thus the measurement accuracy threshold of the ice edge is
dependent upon horizontal resolution (0.6 km) and the ability to discriminate 1/10
coverage of ice.

Priority (1,2 or 3): 2   **RI#**: 4

NPOESS Action Officer: JARG   Phone:

Date Opened: 3 1 Jan 95   Due Date: Response Date: 15 Mar 95

Issue: What are the units for precision and measurement uncertainty aerosol particle size?   Is this optical thickness? There are no units for Precision and measurement uncertainty (accuracy). This particle size parameter is dimensionless. just as optical thickness is dimensionless. Particle size means the Angstrom wavelength exponent, "alpha". It is defined as:

$$\alpha = -\Delta \ln \tau / \Delta \ln \lambda$$

where τ is optical thickness and λ is wavelength. It thus requires optical thickness measurements at a minimum of two different wavelengths. It ranges typically between 0 and 2. and is dimensionless. It is related to particle size. in that larger particles yield aloha values closer to 3. Rayleigh scattering (molecular) corresponds to an alpha of 4. This is really a measure of wavelength dependence of optical thickness, rather than particle size. If the particle size distribution is aiven by an inverse power law. such as a Junge distribution. then alpha can be related to the exponent in the power law. Then an effective particle size. defined as the third moment of the distribution divided by the second moment, can be computed from the resulting size distribution. However. since not all aerosols conform to this size distribution model. it is felt that the Angstrom exponent is a more appropriate indicator of particle size. It also can be used to calculate optical thickness at other wavelengths not measured.

NPOESS
Requirements Issue Form

Priority (**1,2** or 3): 1   RI#: 6

NPOESS Action Officer: JARG   Phone:

Date Opened: 31 Jan 95   Due Date: Response Date: 28 Feb 95

Issue: Need clarification of the requirement for 2 hours of previously imaged data.
Specifically, is the data a continuous window of data changing constantly?   Is this
capability commandable or is it another real time data stream?

Interim response from the IPO is not to include this requirement in the Phase 0 study.
This issue is still in work at the JARG.

NPOESS
Requirements Issue Form

Priority (1,2 or 3): 1   RI#: 7

NPOESS Action Officer: JARG   Phone:

Date Opened: 3 1 Jan 95   Due Date: Response Date: 15 Mar 95

Issue: Need to provide clarification on regional terminal ingest and processing
requirements.   Should existing terminals be used as a baseline to constrain the phase 0
studies?   Or, should they be used as a baseline with impacts identified to meet NPOESS
requirements?   Which EDRs will be processed by these regional terminals? Existing
terminals will need to be upgraded to handle the higher data rates associated with either
the high resolution or low resolution transmissions.   Goal is minimize the impacts to
existing stations. Therefore. existing terminals should be used as a baseline with impacts
identified to meet NPOESS requirements.

Assume that all imagery (vis, ir. microwave) and all sounding (ir. microwave) will be
processed at regional sites. plus ocean parameters, if flown. No requirement exists for
direct broadcast of ozone. trace gas, earth radiation, SESS, etc. Other than these. all
EDRs will be processed at the NOAA sites.

Anticipate DoD will want some SESS processing including electron
density at the regional terminals,

NPOESS
Requirements Issue Form

Priority (1,2 or 3): 1   RI#: 9

NPOESS Action Officer: IPO/Lt Kevin Westley   Phone:

Date Opened: 3 1 Jan 95   Due Date: Response Date: 15 Mar 95

Issue: IPO provide revised definition of RDR to the JARG for review. Full resolution
digital sensor data, time referenced and earth located. with absolute radiometric and
geometric calibration coefficients appended. but not applied, to the data. Aggregates
(sums or weighted averages) of detector samples are considered to be full resolution data
if the aggregation is normally performed to meet resolution and other requirements.
Sensor data must be unprocessed with the following exceptions: time delay and
integration (TDI), detector array non-uniformity correction (i.e., offset and resnonsivity
equalization), and data compression are allowed. Lossy data compression is allowed
only if the total measurement error is dominated by error sources other than the data
compression algorithm.

NPOESS
Requirements Issue Form

Priority (1,2 or 3): 1   **RI#:** 10

NPOESS Action Officer: **IPO/Frank** Deluccia   Phone:

Date Opened: 31 Jan 95   Due Date: Response Date: 28 Feb 95

Issue: IPO recommend quantification of the low light visible radiance level?

The low light visible radiance shall be 4E-9 W/cm^2-sr in the reference 0.4 - 1.0 urn
spectral bandpass or a correspondinn level in a tailored visible bandpass.

NPOESS
Requirements Issue Form

Priority (1,2 or 3): 1   RI#: 12

NPOESS Action Officer: IPO/Capt Mike Crison   Phone:

Date Opened: 3 1 Jan 95   Due Date: Response Date: 24 Mar 95

Issue: What are the interface requirements for the METOP satellites?

The role of METOP in NPOESS is TBD pending an international agreement between the
USG and the European Space Agency (ESA)/European Organisation for the Exploitation
of Meteorological Satellites (EUMETSAT). As of now, there is exists no formal METOP
requirements and/or planned capabilities. However, the following assumptions for the
Phase 0 studies should be made:

 1. A METOP satellite will be available to support meeting some USG requirements, such
as refresh rate. Specifically, one can assume that USG sensors can fly on a METOP
satellite to meet refresh requirements.

2. There are no envelope or other interface restrictions placed on those USG sensors that
flv on METOP satellites.

3. METOP replacement strategy will ensure adequate availability of satellites.

4. No GFE sensors from EUMETSAT to fly on USG satellites.

Additional data regarding METOP will be provided as it becomes available.

Priority (1,2 or 3): 1   RI#: 13

NPOESS Action Officer: JARG   Phone:

Date Opened: 31 Jan 95   Due Date: Response Date: 28 Feb 95

Issue: Do the EDR requirements for cloud imagery apply to visible, IR, and nighttime visible imagery? Specifically, what is the horizontal spatial resolution requirements for nighttime bisible imagery?

There is no specific requirements for nighttime visible imagery, however, the cloud data requirements including cloud typing are required at nighttime.

NPOESS
Requirements Issue Form

Priority (1,2 or 3): 2   RI#: 18

NPOESS Action Officer: JARG   Phone:

Date Opened: 3 1 Jan 95   Due Date: Response Date: 15 Mar 95

Issue: The IORD specifies Total Water Content in terms of Total Integrated Water
Vapor and Cloud Liquid Water. These EDRs are also specified in Precipitable Water
and Cloud Liquid Water. A similar situation apparently occurs in the specification of
Cloud Ice, Liquid Equivalent (which involves profiles of cloud ice) and Cloud Ice Water
Path (total column of ice mass as water equivalent). Why are multiple and conflicting
specifications given for Precipitable Water and Cloud Liquid Water? Recommendation
is to consolidate specification into single EDR requirements. Eliminate (Total Water
Content). Also, eliminate (Cloud Ice. Liauid Eauivalent) and consolidate these into a
single EDR requirement.

NPOESS
Requirements Issue Form

Priority (1,2 or 3): 2   **RI#**: 19

NPOESS Action Officer: JARG   Phone:

Date Opened: 3 1 Jan 95   Due Date: Response Date: 15 Mar 95

Issue: What is the definition for shortwave, longwave, and visible radiation? Shortwave
radiation refers to solar radiation that gets reflected back by the Earth and the
atmosphere. It generally is in the spectral wavelength interval between 0.3 and 4
micrometers.

Longwave radiation refers to the radiation that is emitted by the Earth or the atmosphere.
It generally is in the spectral wavelength interval between 4 and 50 micrometers.

Visible radiation is the radiation that the human eve senses as art of the process of
"seeinn".   It generally is in the spectral wavelength interval between 0.4 and 0.7
micrometers.   The blue end is near 0.4 micrometers and the red end is near 0.7
micrometers.

NPOESS
Requirements Issue Form

Priority (1,2 or 3): 1   RI#: 20

NPOESS Action Officer: JARG   Phone:

Date Opened: 31 Jan 95   Due Date: Response Date: 28 Feb 95

Issue: What do the users mean by horizontal resolution for (a) imagery and (b) sounder-derived EDRs? For example, for cloud imagery, does the user want to be able to discern 0.65 km gaps between clouds?

Yes, must be able to discern both clouds and gaps.

As another example, for the atmospheric vertical moisture profile, does the user want the moisture in layers 10 km by 10 km, as a goal, or in square portions of layers of even smaller size in order to discern horizontal gradients over 10 km?

One EDR value for each 10km by 10km sample

NPOESS
Requirements Issue Form

Priority (1,2, or 3): 1   RI #: 21

NPOESS Action Officer: JARG   Phone:

Date Opened: 2 Feb 95   Due Date: Response Date: 15 Mar 95

Issue: Definition of the "detail" of the vertical moisture and temperature structure of the
atmosphere is accomplished through the vertical "resolution" of a sounder and not by its
sampling interval . Taking more samples does not in any way improve or affect the detail of
the vertical structure resolved. By specifying a "number of samples", is the requirement for
the level of structured detail desired or simply the number of samples they intend to take?
Sampling interval is iust the number of samples. The reauired vertical resolving **power** of the
sounder depends **upon** the measurement **accuracy**. For example, for temperature. the
accuracy that is listed is 0.5 K. This accuracy should have been associated with a laver
thickness. **Obiectives** for temperature should be 0.5 **K/0.5** km lavers in the troposphere. 0.5
K/1-0 km lavers into the stratosphere and 0.5 K/2 km lavers in the **stratosphere**. The accuracy
will drive the reauired resolving power. Likewise. for moisture. the 10% error needs to be
associated with a laver (**10%/**1 km laver).

Priority (1,2, or 3): 1   RI # 22

NPOESS Action Officer: JARG   Phone:

Date Opened: 2 Feb 95   Due Date: Response Date: 15 Mar 95

Issue: Sea Ice Age Measurement Accuracy: Should the threshold and objective of 30% and 10% of area defined correctly actually be 70% and 90%? <u>Yes</u>

NPOESS
Requirements Issue Form

Priority (1,2, or 3): 1   RI # 23

NPOESS Action Officer: JARG   Phone:

Date Opened: 2 Feb 95   Due Date: Response Date: 15 Mar 95

Issue: Do we need to specify both absolute and relative humidity for atmospheric vertical moisture profile? Both. Moisture accuracv needs to be expressed as relative humiditv to be meaningful. The problem with snecifvinn accuracv in terms of absolute humiditv is that one cannot define an error limit that is meaninnful to all atmospheres. The actual moisture retrieval should be in units of mixing ratio, which can then be converted. with knowledge of the temperature and pressure, to absolute humidity or relative humiditv. Mixing ratio can also be converted to total or laver precipitable water.

NPOESS
Requirements Issue Form

Priority (1,2 or 3): 1   RI#: 28

NPOESS Action Officer: JARG   Phone:

Date Opened: 2 Feb 95   Due Date: Response Date: 15 Mar 95

Issue: Several of the **EDRs** appear to be redundant.   Were these intended to be separate
EDRs, as inputs to build other products, or alternative methods to get the same
information? Three groupings are as follows:
        1. Cloud Top Pressure, Cloud Top Temperature, Cloud Top Height

        2. In-situ Plasma Density, In-situ Plasma Temperature, In-situ Ion Drift Velocity

        3. **Longwave** Radiation, Net Radiation **(TOA),** Net Surface Shortwave Radiation,
        Total **Longwave** Radiation **(TOA),** Total Shortwave Radiation, Total Solar
        Irradiance (Full Spectrum).

All EDRs should be assumed to be stand alone. However. many EDRs are used as inputs
to others. not as alternate methods of producing the same information. EDRs are not
redundant.

NPOESS
Requirements Issue Form

Priority (1,2 or 3): 1   RI#: 30

NPOESS Action Officer: JARG   Phone:

Date Opened: 2 Feb 95   Due Date: Response Date: 15 Mar 95

Issue: Reference Albedo: Are you refreshing the reflectivity of the earth every 6 hours?
Is there a vertical sampling interval for this parameter? No. refresh is the resampling of
the parameter at the stated interval over any given location on the surface of the Earth.
The spectral range for the albedo is typically given as 0.3 to 4 micrometers.   This covers
most of the solar spectral range. without entering much of the region where there is
thermal emission. There is no vertical sampling interval for this parameter.

NPOESS
Requirements Issue Form

Priority (1,2 or 3): 1   RI#: 32

NPOESS Action Officer: JARG   Phone:

Date Opened: 2 Feb 95   Due Date: Response Date: 15 Mar 95

Issue: Sea Surface Temperature: Is the skin and/or mixed layer temperature desired? With infrared systems it is the skin temperature that is measured. and someday that will be the desired parameter to be measured.   However. there currently are not enough in situ skin temperature measurements to accurately calibrate and validate satellite sea surface skin-temperature measurements which are at least 1 meter depth (i.e.. a surface-layer temperature measurement representative of the top 1 meter of the ocean or lake). For the era of the converged satellite system. both skin and surface-layer sea surface temperature measurements will be desired.

NPOESS
Requirements Issue Form

Priority (1,2 or 3): 1   RI#: 33

NPOESS Action Officer: JARG   Phone:

Date Opened: 2 Feb 95   Due Date: Response Date: 15 Mar 95

Issue: Aerosol optical thickness.   What is the utility of this EDR which affects the particular spectral bands that should be sensed?   Also, optical thickness is a vertically integrated quantity: profiles are better expressed in terms of extinction coeffkients for each layer. Is this acceptable? The utility of aerosol optical thickness is to have a measure of the canability of aerosol particles suspended in the atmosphere to extinguish radiation. These particles reflect incoming solar radiation and absorb Earth's outgoing thermal radiation. Differences in the amounts reflected and absorbed can alter the Earth's radiation balance. and can force the climate to change if sustained over a sufficiently long period of time. These radiative effects can also introduce errors in other satellite remotelv sensed parameters. such as vegetation index, sear surface temperature, and atmospheric temperature profiles. A measurement at one wavelength is sufficient to estimate the optical thickness at other wavelengths. given the "alpha" parameter described in the previous answer. Thus. a minimum of two wavelengths are reauired. These wavelengths should be separated bv at least 200 nanometers in wavelength, and be in regions of the spectrum where aerosol scattering will be the principle source of reflected radiation. i.e.. awav from Rayleigh scattering. water vapor and other gaseous absorption bands. and in regions where oceanic reflectance is a minimum.

Aerosol profiles have conventionally been represented by extinction coefficient. e.g., the NASA/SAGE solar occultation data. However. it could just as well be represented by layer mean optical thickness. which is just the product of extinction coeffkient and laver thickness. Either way is acceptable.

NPOESS
Requirements Issue Form

Priority (1,2 or 3): 1   **RI#**: 34

NPOESS Action Officer: JARG   Phone:

Date Opened: 7 Feb 95   Due Date: Response Date: 15 Mar 95

Issue: Cloud Imagery: Further **define** "global" and "regional" resolution.

Global refers to "low resolution" and regional refers to "high resolution" data

Is regional resolution data required at the central sites?   **YES**

If so, how much of the data collected in one orbital period is required to be downlinked?
Two-thirds (2/3) of the nrevious orbit of **high** resolution data which may not be
contiguous and is commandable.

NPOESS
Requirements Issue Form

Priority (1,2 or 3): 1   RI#: 36

NPOESS Action Officer: IPO/Frank De Luccia   Phone:

Date Opened: 2 Feb 95   Due Date: Response Date: 15 Mar 95

Issue: Albedo: Need a firm spec for the spectral band for which the albedo is desired.
The requirements on measurement range, vertical sampling interval and refresh are
unclear.   It is assumed that the measurement is for a hemispherically averaged albedo.
ALSO SEE RESPONSE TO RI# 30- The spectral range for albedo is typically given as
0.3 to 4 micrometers. This covers most of the solar spectral range. without entering
much of the region where there is thermal emission. Vertical sampling interval for this
EDR. Refresh rate is as stated. Refresh rate is as stated. Do not assume that this is for
hemispherically averaged albedo.

NPOESS
Requirements Issue Form

Priority (1,2 or 3): 2   **RI#**: 39

NPOESS Action Officer: JARG   Phone:

Date Opened: 2 Feb 95   Due Date: Response Date: 10 Feb 95

Issue: Future AF Nephanaylsis requires determination of the % cloud coverage; the number of layers; the height of each layer; and the cloud type of which each layer is composed.   Is that a fair expression of this NPOESS requirement?

Same issue as RI #26, delete.

NPOESS
Requirements Issue Form

Priority (1,2 or 3): 2   **RI#**: 40

NPOESS Action Officer: JARG   Phone:

Date Opened: 2 Feb 95   Due Date: Response Date: 15 Mar 95

Issue: Cloud ice, liquid equivalent: If mixing ratio is meant (grams of ice/grams of air)
why is liquid water equivalent needed? It is recommended that liquid water eauivalent
be eliminated.

NPOESS
Requirements Issue Form

Priority (1,2 or 3): 2   RI#: 41

NPOESS Action Officer: JARG   Phone:

Date Opened: 2 Feb 95   Due Date: Response Date: 15 Mar 95

Issue: Cloud liquid water: If the requirement is as stated, this EDR is redundant; cloud liquid water content is a component of total water content, 40.62.   Is this intended to be the vertical profile of the cloud liquid water content?   What units are preferred for this EDR? As for redundancy. note that the Total Water Content EDR is to be eliminated, Cloud Liquid Water. should be changed to read "Cloud Liquid Water Path'. It is not intended to be a vertical profile. The preferred units are mm.

NPOESS
Requirements Issue Form

Priority (1,2 or 3): 2   RI#: 42

NPOESS Action Officer: JARG   Phone:

Date Opened: 2 Feb 95   Due Date: Response Date: 15 Mar 95

Issue: Cloud ice water path: What is the meaning of the reference to the particle
number density, size distribution and density of the particles?   What is the meaning of
the vertical sampling interval here? The reference is unnecessary; it only provides the
information that the cloud ice water path is a function of number of particles. their sizes,
and their densities. The vertical sampling interval is not applicable to this narameter.

NPOESS
Requirements Issue Form

Priority (1,2 or 3): 2   RI#: 43

NPOESS Action Officer: JARG   Phone:

Date Opened: 2 Feb 95   Due Date: Response Date: 15 Mar 95

Issue: Cloud optical depth/transmittance: Are there particular spectral bands for which the cloud optical depth is desired?   Does the measurement uncertainty goal of ±5% apply to the optical depth or the transmittance? The optical depth equals the negative natural logarithm of the transmittance. In the visible. cloud optical depth is desired at about 0.6 microns. In the infrared. the transmittance and the emissivity are required at about 11 microns. The measurement uncertainty goal applies to transmittance.

NPOESS
Requirements Issue Form

Priority (1,2 or 3): 2   RI#: 44

NPOESS Action Officer: JARG   Phone:

Date Opened: 2 Feb 95   Due Date: Response Date: 15 Mar 95

Issue: Cloud Top Pressure: Is this only for the highest cloud layer?   The implication of
the measurement uncertainty goal is that a cloud top height of 500-600 meters is
acceptable; this is inconsistent with Cloud Top Height. The cloud ton pressure prefers to
the top of all opaque cloud lavers. For thin semitransparent cirrus, the nressure at the
mean vertical position of the cirrus laver is sufficient. There is a potential inconsistency
in the measurement uncertainty goals for cloud ton nressure and cloud ton height, since
the height variation is linked hvdrostaticallv to the nressure variation and the mean
virtual temperature. A 30 mb goal in nressure would correspond to 300 meters near the
surface. to about 400 meters around the 600 mb level. and to about 700 meters at the 300
mb level. The nressure goals should be modified to correspond to the Cloud Top Height
EDR.

Priority (1,2 or 3): 2   RI#: 46

NPOESS Action Officer: JARG   Phone:

Date Opened: 2 Feb 95   Due Date: Response Date: 15 Mar 95

Issue: Cloud Top height: Assume that this measurement applies to all cloud layers present? For Clout Top Height. as well as Cloud Top Pressure. the "measurement" would apply to all identified opaque cloud lavers. For thin cirrus, the mean cloud position is satisfactory. The method for defining cloud base height from satellite measurements, again applied to identified opaque cloud lavers, has not been clearly established from the remote sensing data. The base height in general would be derived indirectly from other cloud parameters. such as the top height, optical thickness. effective particle size, and/or the liquid water path.

NPOESS
Requirements Issue Form

Priority (1,2 or 3): 2   RI#: 50

NPOESS Action Officer: JARG   Phone:

Date Opened: 2 Feb 95   Due Date: Response Date: 15 Mar 95

Issue: Fresh Water Ice Concentrations: The need to specify a vertical sampling interval
for the measurement of ice thickness is unclear.   What is the point to the omission of a
"no ice" condition in the minimum requirement for ice concentration? The vertical
sampling interval for ice thickness is not meaningful and has been eliminated from the
requirements list. Similar to sea ice, the ability to discriminate <1/10 coverage of ice is
difficult at the stated horizontal resolution.

NPOESS
Requirements Issue Form

Priority (1,2 or 3): 2   RI#: 51

NPOESS Action Officer: JARG   Phone:

Date Opened: 2 Feb 95   Due Date: Response Date: 15 Mar 95

Issue: Ice surface temperature: Is a skin temperature or an equivalent air "shelter" temperature more desirable? Both temperatures are desirable in the production of an ice analysis. Drifting buoys of the U.S. Interagency Arctic Buov Program are now being outfitted with shielded external thermistors on 2 meter high masts. The objective is to obtain a more accurate measurement of ambient air temnerature not of the ice itself.

NPOESS
Requirements Issue Form

Priority (1,2 or 3): 1   RI#: 54

NPOESS Action Officer: JARG   Phone:

Date Opened: 2 Feb 95   Due Date: Response Date: 15 Mar 95

Issue: EDR Processing: Does the 20 minute EDR processing time apply to each EDR?
NO. the 20 minute EDR processing time is to be used as a guideline onlv. Because some
EDRs require ancillary data. additional processing times may be needed. but are bevond
the contractors control.

Do all centrals have to process all EDRs within the 20 minute requirement? NO, not all
centrals will process all EDRs.

Does the IDPS have to process EDRs at the Non-DoD central and regional terminals?
NO, the IDPS does not, as currently planned, have to process EDRs at the non-DOD
central and regional terminals.

What are the requirements for the IDP processing at regional sites (high & low rate
transmission)?   Also, routing data just to the centers of expertise could impact timeliness
and survivability. For NOAA. the IPD must be able to ingest the high and low data rate
transmissions at the regional sites. but does not have to process them into EDRs. The
regional sites will have that responsibility.

NPOESS
Requirements Issue Form

Priority (1,2, or 3): 2   RI # 55

NPOESS Action Officer: IPO/ADO   Phone:

Date Opened: 2 Feb 95   Due Date: Response Date: 15 Mar 95

Issue: What is the nominal turnaround time for the AFSCN and CDA sites for polar
spacecraft? Nominal turnaround time at the NOAA CDAs for polar acquisition is 3 to 5
minutes from loss of signal from nrecedina satellite. However. Wallops has the canabilitv to
track two polar satellites simultaneouslv. but onlv if one of the antennas is not being used for
GOES, and Fairbanks can track two polar satellites simultaneously also.

Change to "5 minutes should be assumed
for both the AFSCN and CD+ sites"

NPOESS
Requirements Issue Form

Priority (1,2, or 3): 2   RI # 56

NPOESS Action Officer: JARG   Phone:

Date Opened: 2 Feb 95   Due Date: Response Date: 15 Mar 95

Issue: Spec para 3.3.4.1: Clarify if the IDP is designed to store and process DMSP, POES &
NPOESS data. (i.e. does NPOESS IDP have to deliver DMSP and POES EDRs?) For the
Phase 0 studies. assume that the IDP processes only NPOESS data.

NPOESS
Requirements Issue Form

Priority (1,2, or 3): 1   RI # 57

NPOESS Action Officer: IPO/Roberta Gleiter   Phone:

Date Opened: 2 Feb. 95   Due Date: Response Date:

Issue: Which sites are considered Centrals and require downlink of the stored data stream?

Reference: IORD, Final Draft dated 16 Dec. 1994

Several references to the composition of Centrals is included in the reference IORD.
1.   C3 Segment (para. 1.4.1.3) parenthetically defines Centrals as Air Force Global Weather Central (AFGWC), Fleet Numerical Meteorological and Oceanographic Center (FNMOC), and National Environmental Satellite, Data, and Information Service (NESDIS).

2.   Centrals Component (papa 1.4.1.4.1) discusses Centrals such as AFGWC, FNMOC, NESDIS, and EUMETSAT (TBD).

3.   Definitions (Attachment 3) offers the following definition: "Components of the Interface Data Processor Segment which are designated data processing centers; for example, facilities such as AFGWC, NESDIS, NIC, NAVOCEANO, and AFSFC are centrals."

As a point of information, the most comprehensive list of Centrals would include the following: Air Force Global Weather Central (AFGWC), Fleet Numerical Meteorological and Oceanographic Center (FNMOC), and National Environmental Satellite, Data, and Information Service (NESDIS), EUMETSAT (TBD), National Ice Center, NAVOCEANO, and AFSFC.

Response: Based on verbal inputs from the JARG representative, Capt. P. Wilczynski, at the MM TIM (1-2 Dec. 1994) the Centrals are Air Force Global Weather Central (AFGWC), Fleet Numerical Meteorological and Oceanographic Center (FNMOC), and National Environmental Satellite, Data, and Information Service (NESDIS). and AFSFC

NPOESS
Requirements Issue Form

Priority (1,2, or 3): 2   RI # 58

NPOESS Action Officer: JARG   Phone:

Date Opened: 2 Feb 95   Due Date: Response Date: 15 Mar 95

Issue: COMSEC: Although there is no requirement to encrypt SDC and SAR data, is it
acceptable to encrypt this data along with other data requiring encryption? For the purposes
of the Phase 0 studies, assume that SDC and S&R data shall not be encrypted.

NPOESS
Requirements Issue Form

Priority (1,2, or 3): 3   RI # 59

NPOESS Action Officer: JARG   Phone:

Date Opened: 2 Feb 95   Due Date: Response Date: 15 Mar 95

Issue: Encryption: Can NOAA identify numbers and locations of direct downlink location that will need to be supported in an encrypted mode? NOAA has a limited number of direct downlink stations that will need to be supported in an encrypted mode. At a minimum. these include HRPT/APT/LRPT stations at: Redwood City. CA: Norman. OK; Coral Gables. FL; Suitland. MD; Wallops Island. VA; Fairbanks. AK; Sioux Falls. SD; GSFC, Greenbelt. MD; and Martin-Marietta. East Windsor. NJ.

However. due to other national and international agreements, we may need to support direct downlink stations for other US Govt agencies (i.e.. FEMA. USGS. NASA. DOI, DOA, etc.). Exact locations and numbers are unknown at this time. In addition. we should plan on having to support similar stations in Europe (EUMETSAT member state stations). Australia. New Zealand, and some sites in Asia and Africa (due to agreements with WMO. the UN. etc.)

NPOESS
Requirements Issue Form

Priority (1, **2,** or 3): 2   **RI #**: 60

NPOESS Action Officer: JARG   Phone:

Date Opened: 2 Feb 95   Date Due: Response Date: 15 Mar 95

Issue: For measurement of Land Surface Temperature, is skin and/or shelter temperature required? Is only soil temp required or are other surfaces (non-soil) types also required? Precision of 0.025 K is extremely challenging. Is precision goal correct? <u>The requirement for land surface temperature refers to skin temperature.</u>

NPOESS
Requirements Issue Form

Priority (1, 2, or 3): 2   RI #: 62

NPOESS Action Officer: JARG   Phone:

Date Opened: 2 Feb 95   Date Due: Response Date: 15 Mar 95

Issue: For **Longwave** Radiation, the need is for consistent and comparable long term records (decades). Is the downward longwave radiation (DLR) required for multiple atmospheric levels or just at the surface? What is required for the other radiation balance components? The longwave radiation at the surface is not the outgoing longwave radiation. but the downward longwave radiation (DLR). It is reauired iust at the surface. What is required throughout the atmosphere for at least four lavers is the longwave cooling (proportional to the divergence of the longwave radiation). In other words, for a given laver. the longwave cooling is proportional to the incoming longwave radiation to the layer from above and below it minus the outgoing longwave radiation (above and below).

NPOESS
Requirements Issue Form

Priority (1, 2, or 3): 2   **RI** #: 63

NPOESS Action Officer: JARG   Phone:

Date Opened: 2 Feb 95   Date Due: Response Date: 15 Mar 95

Issue: Is Net Heat Flux derived from measurements of Sea Surface Temperature, Temperature and Moisture Profiles and Sea Surface Winds? No, this is a parameter unto itself. and is connected with radiation.

NPOESS
Requirements Issue Form

Priority (1, 2, or 3): 2   RI #: 64

NPOESS Action Officer: JARG   Phone:

Date Opened: 2 Feb 95   Date Due: Response Date: 15 Mar 95

Issue: Net Radiation at Top of Atmosphere, is the determination of the average daily
difference between the Total Solar b-radiance and the Outgoing Longwave Radiation.
Would the required set of earth/atmosphere heat balance measurements best be treated as
a single EDR as currently done by the CERES Science Team? This parameter is not
state correctly. The net radiation (TOA) is the average daily solar irradiance (remember
unit horizontal area) minus the total outgoing: radiation flux (again through a horizontal
unit area). The outgoing radiation is the sum of the reflected solar radiation (TOA) and
the emitted longwave radiation at the TOA. Alternatively, it is the absorbed solar
radiation (TOA) minus the emitted longwave radiation (TOA). These two alternates are
mathematically identical. The second definition is preferred. since it can be derived from
two parameters that already have been defined in terms of EDRs. A new EDR for this
parameter is really not necessary.

NPOESS
Requirements Issue Form

Priority (1, 2, or 3): 2   RI #: 66

NPOESS Action Officer: JARG   Phone:

Date Opened: 2 Feb 95   Date Due: Response Date: 15 Mar 95

Issue: For Ocean Wave Characteristics, all specifications apply to wave height; there are no specifications regarding wave periods. Is this accurate? <u>The reauirement is for both wave height and period within the specification stated.</u>

NPOESS
Requirements Issue Form

Priority (1, 2, or 3): 2   RI #: 67

NPOESS Action Officer: JARG   Phone:

Date Opened: 2 Feb 95   Date Due: Response Date: 15 Mar 95

Issue: For Precipitable Water, who is going to specify the volume of atmosphere and
when? It is typically applied to a total column; if true, vertical sampling interval has no
meaning. Is the volume integral or not? Preciuitable water can be for the total
atmosphere or for given lavers. Either one is derivable from the sounder's water vapor
mixing ration profile. Vertical sampling is meaningful, because it specifies how to
perform the integration. Note some algorithms (SSMI) retrieve total nrecinitable water
directly. However for sounders. a profile is generated. The users will need to specify the
lavers, however. once thev are known. the transformation is trivial. Users will need to
determine the preferred lavers.

NPOESS
Requirements Issue Form

Priority (1, 2, or 3): 2   RI #: 69

NPOESS Action Officer: JARG   Phone:

Date Opened: 2 Feb 95   Date Due: Response Date: 15 Mar 95

Issue: For Sea Surface Height/Topography, what needs to be refreshed every 3 hours?
All requirements listed need to be refreshed (updated) every three hours.

NPOESS
Requirements Issue Form

Priority (1, 2, or 3): 2   RI #: 72

NPOESS Action Officer: JARG   Phone:

Date Opened: 2 Feb 95   Date Due: Response Date: 15 Mar 95

Issue: Is Surface Wind Stress totally derived from sea surface winds, the difference between the wind and wave velocity and the sea surface roughness? Clarify the use of surface wind stress measurements. Wind stress is a narameter used as input for the forcing; function in ocean circulation models. Wind stress (τ) is computed as:

$$\tau_x = C\rho u^2$$
$$\tau_y = C\rho v^2$$

C = drag coefficient u, v = wind speed
ρ = air density

τ is a derived variable. Main input is sea surface wind. ρ and C come from other sources, therefore τ should probably not be an EDR.

NPOESS
Requirements Issue Form

Priority (1, 2, or 3): 2   RI #: 73

NPOESS Action Officer: JARG   Phone:

Date Opened: 2 Feb 95   Date Due: Response Date: 15 Mar 95

Issue: Total **Longwave** Radiation at Top of Atmosphere is one component of the Net Radiation at Top of Atmosphere. Why would the refresh goal be different from that specified for Total Shortwave Radiation? Since solar radiation can **only** be absorbed on the davliaht side of an orbit (YOU need incident solar radiation). one can onlv refresh **every** 24 hours (Earth rotation in a single dav. However. the total **longwave** radiation can be measure dav and night. since emission occurs at both times. Therefore. one can and should refresh at half the time as that for the absorbed solar radiation.

NPOESS
Requirements Issue Form

Priority (1, 2, or 3): 2   RI #: 74

NPOESS Action Officer: JARG   Phone:

Date Opened: 2 Feb 95   Date Due: Response Date: 15 Mar 95

Issue: How is Total Solar Irradiance Full Spectrum different from Total Shortwave
Radiation? What is to be refreshed every 24 hours? Total Solar Irradiance, Full
Spectrum. refers to the total radiation energy from the sun that is incident on a unit
horizontal area at the TOA. What we want to measure is the total enerav from the sun
per unit area falling on a plane nernendicular to the direction of the incident solar
radiation. This is equivalent to the solar constant corrected for the actual earth-sun
distance. Then, the range would be approximatelv 1372 W/m^2 +/- 3.5%. or 1325 to 1423
W/m^2 spectrum and Total are redundant.

Total incoming shortwave radiation should be replaced bv either the net shortwave
radiation (TOA) or its equivalent. the absorbed solar radiation (solar radiation that is
absorbed bv the Earth and the atmosphere). The stated measurement range is consistent
with this definition.

A refresh rate of 24 hours is consistent for a single polar orbited, since measurements can
onlv be seen on the daylight side of the orbit. A refresh rate or 12 hours would required
two satellites. This is consistent with what is required fro parameter discussed in RI#73.

NPOESS
Requirements Issue Form

Priority (1, 2, or 3): 2   RI #: 76

NPOESS Action Officer: JARG   Phone:

Date Opened: 2 Feb 95   Date Due: Response Date: 15 Mar 95

Issue: Can Wave Spectral Energy be calculated from the measurements of Ocean Wave Characteristics? Since Wave Spectral Energy is a measure of sea state. yes it could be calculated from the measurements of Ocean Wave Characteristics. However. the two should not be tied together. Wave Spectral Energy is needed whether or not Ocean Wave characteristics and can be provided. If Ocean Wave Characteristics are available then the Wave Spectral Enerav might be able to be derive. But, it Ocean Wave Characteristics can not be Provided, and Wave Spectral Energy is tied to it. then the spectral energy would be lost as well.

NPOESS
Requirements Issue Form

Priority (1,2, or 3): 2   **RI # 77**

NPOESS Action Officer: **IPO/Capt** Lee Rosen

Date Opened: 2 Feb 95   Due Date: Mar 95   Response Date: 21 Feb 95

Issue: Can the DMSP STAR, July 94 be available in the technical library?

Yes. the DMSP STAR is now in both libraries. It is classified No **Foreign**, WNINTEL. To see the STAR, contact:

      Los Angeles: Lt Rob **Lew** (310) 336-4031
                       Lt Kevin Westley (310) 336-4085

      Silver Spring: Capt Mike Crison (301) 713-3580
                       Lt **Col** Joseph Parsley (301) 713-3580

NPOESS
Requirements Issue Form

Priority (1,2, or 3): 2   RI # 80

NPOESS Action Officer: JARG   Phone:

Date Opened: 2 Feb 95   Due Date: Response Date: 15 Mar 95

Issue: MUSL - Is the 10 years after FOC or 10 years after IOC? <u>MUSL (Minimum Useful Satellite Lifetime) shall be assumed to 10 years after FOC.</u>

NPOESS
Requirements Issue Form

Priority (1,2, or 3): 2   RI # 81

NPOESS Action Officer: JARG   Phone:

Date Opened: 2 Feb 95   Due Date: Response Date: 15 Mar 95

Issue: Is Operational Availability of 0.95 for the entire Space Segment or for a single satellite? What is the difference between availability and dependability? What is the difference between a downing event and a critical failure? The definitions need more detail. Operational Availability of 0.95 applies to the Space Segment. It should be assumed to apply to the total space constellation configuration.

Additional Clarification is in work.

NPOESS
Requirements Issue Form

Priority (1,2, or 3): 2   RI # 82

NPOESS Action Officer: JARG   Phone:

Date Opened: 9 Feb 95   Due Date: Response Date: 15 Mar 95

Issue: There is no data availability requirement for mission data to be processed and provided to the field users, The only requirement that refers to the field terminals in this section is as follows: "Data shall be provided directly to field users as collected." There will be some processing time delay between the receipt of the data on the direct downlink and when the data has been processed and available to the field users. If there is a requirement which states how quickly the data will need to be processed, it should be stated in this section. Otherwise, it will be the subject of a trade.

RECOMMENDATION: We recommend that the requirement for maximum acceptable processing time for the field terminals be defined. If that requirement is not available, then as a minimum, the requirement should read as follows: "Processing time for mission data processed by the field terminals shall not exceed TBD minutes from the time the data is received." Accept the recommendation of "Processing time for mission data processed by the filed terminals shall not exceed TBD minutes from the time the data are received." Clarification must be added to this to stipulate that for NOAA field terminals. there is no reauirement for the IDP to process RDRs into EDRs, therefore. the processing time restriction does not apply.

NPOESS
Requirements Issue Form

Priority (1,2, or 3): 2   **RI** # 83

NPOESS Action Officer: JARG   Phone:

Date Opened: 9 Feb 95   Due Date: Response Date: 15 Mar 95

Issue: What is the definition of "field terminal"? The current use of "field" applies to all "non-central" terminals (universities, STT, Mark IVB, SMQ-11, etc.) Each of these users may have different requirements. Unless all field terminals have identical requirements, the following terms would better define the individual characteristics of the users. We suggest the use of three separate terms: portable field terminal (STT), large field terminal (universities, Mark IVB, SMQ-1 1), and specialized centers (centers of expertise). The current term "field terminals" encompasses all three of these terms. For NOAA, and its' supported/sponsored "field terminals". the following should apply: "Field terminals shall include commercially procured or locally constructed equipment that nermits users t obtain high resolution direct downlinked data similar to those currently available from the NOAA HRPT downlink (requires a tracking antenna). also those data broadcast from the current NOAA APT downlink (requiring an omni antenna)"

NPOESS
Requirements Issue Form

Priority (1,2, or 3): 2   **RI # 87**

NPOESS Action Officer: JARG   Phone:

Date Opened: 13 Feb 95   Due Date: Response Date: 28 Feb 95

Issue: Clarification is needed for the term "Vertical Sampling Interval" as applied to sounding.

RECOMMENDATION: Use the following definition: "Vertical Sampling Interval represents the pressure levels at which the moisture profile is to be specified."

This recommendation is accented. The definition in the IORD is broad and this specific definition provides clarification for soundings without contradicting the original definition.

NPOESS
Requirements Issue Form

Priority (1,2, or 3): 2   RI # 90

NPOESS Action Officer: JARG   Phone:

Date Opened: 13 Feb 95   Due Date: Response Date: 15 Mar 95

Issue: For Sea Surface Temperature, how is Coastal Region defined?

RECOMMENDATION: The ISWG recommends that the Coastal Region be defined as the part of the scan where land contaminates the sounding. <u>The Coastal Region is the portion of the coastal waters out to annroximatelv 200 nautical miles from the coast. This is the area for which the "coastal" forecast offices have the resnonsibilitv to provide forecasts. Anv thing beyond the 200 mile zone is considered high seas and are the resoonsibilitv of a forecast center.</u>